Full-Scale Fire Test Facility Building 275

Completed in 1980, the Full-Scale Fire Test Facility, Building 275, located in the Safety Research and Development area at the FAA William J. Hughes Technical Center, is the largest U.S. Government operated facility of its kind.

A 40-foot-high fire-hardened ceiling allows testing with large pool fires under controlled conditions. There are currently two aircraft fuselages inside the facility which can be set up to simulate a variety of test conditions. The narrow-body Boeing 707 test article can be configured for cabin water mist, seat comparison, and burnthrough tests, while the 132-foot-long hybrid DC-10 test article has the added capability of supporting cargo compartment fire simulations in three fully instrumented sections. Continuous gas sampling, temperature measurements, smoke levels, heat flux, and acid gases can be monitored in each of the test sections. The data obtained from the fire tests can be transferred into hazard models designed to generate estimated survival times at particular cabin locations. All testing is conducted from a remote area that contains state-of-the-art video monitoring equipment for continuous observation. Both in-flight and postcrash fire scenarios have been studied, which has led to the development of vastly improved fire safety standards for aircraft cabin interiors and cargo compartments.

In addition to the two test articles, there are small test chambers located within the facility that are capable of supporting existing and new laboratory-scale tests, as well as quick mock-up work often required during accident investigations. A full-length attached warehouse serves as an enclosure for the many aircraft components and equipment required to support the full-scale tests.

Currently, there are two major research programs underway at this facility: halon replacement and fuselage burnthrough.

Halon Replacement

Halon, a gaseous extinguishing agent used in aircraft cargo compartments, engine nacelles, lavatory trash receptacles, and hand-held extinguishers, is the most effective fire extinguishing agent on a weight basis. Although effective, halon depletes stratospheric ozone. Halon manufacturing was banned under the 1994 Montreal Protocol, a treaty signed by countries around the world. The FAA is in the process of developing minimum performance standards by which replacement agents' effectiveness can be measured. Candidate fire protection systems for the cargo compartment areas include gaseous agents, pyrotechnically generated aerosols, and water mist. The photograph on the next page depicts the initial stages of a cargo compartment fire scenario against which the various agents will be evaluated.

Fuselage Burnthrough

After an accident, fuel fire flames can enter the cabin through an inadvertently open escape exit or, in a more severe impact, through a break in the fuselage. Fire can also enter the cabin by penetrating the fuselage structure, which is the focus of this research project. In an accident in Manchester, England, in 1985, 55 fatalities occurred due to the rapid burnthrough from an external fire. As a result of this accident, fire tests were conducted to determine the burnthrough paths and the time frames involved in order to better understand the accident scenario. The emphasis of the current test program is on evaluating improvements to delay the burnthrough time and thereby increase the escape time and to validate test work being performed on a medium-scale burnthrough rig. To date, several technologies have emerged that have the capability of delaying burnthrough for several additional minutes. The photograph below shows the external pool fire used during these experiments.

To find out more about the Full-Scale Fire Test Facility, contact:

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